

tered Mg-containing medications can cause hypermagnesemia in patients with normal renal function. With the increasing use of multiple doses of Mg-containing cathartic therapy for poisoned or overdosed patients, more patients will receive higher Mg loads. Safe upper limits for Mg dosage by this route have not been established. Therefore, when treating patients in this manner, physicians should consider monitoring Mg levels and renal function and must be vigilant for signs and symptoms of hypermagnesemia. An alternative is the use of sorbitol^{1,5} as a cathartic, although its safety in multiple doses has not been well studied.

REFERENCES

1. Shannon M, Fish SS, Lovejoy FH: Cathartics and laxatives—Do they still have a place in management of the poisoned patient? *Med Toxicol* 1986; 1:247-252
2. Mordes JP, Wacker WEC: Excess magnesium. *Pharmacol Rev* 1978; 29:273-300
3. Rude RK, Singer FR: Magnesium deficiency and excess. *Annu Rev Med* 1981; 32:245-259
4. Fassler CA, Rodriguez RM, Badesch DB, et al: Magnesium toxicity as a cause of hypotension and hypoventilation—Occurrence in patients with normal renal function. *Arch Intern Med* 1985; 145:1604-1606
5. Rumack BH (Ed): *POISINDEX* Information System, 33rd Ed. Denver, Micromedex, 1986
6. Alfrey AC: Disorders of magnesium metabolism, *In* Schrier RW (Ed): *Renal and Electrolyte Disorders*, 2nd Ed. Boston, Little, Brown, 1980, pp 299-319
7. Sutton RAL, Dirks JH: Calcium and magnesium: Renal handling and disorders of metabolism, *In* Brenner BM, Rector FC (Eds): *The Kidney*, 3rd Ed. Philadelphia, WB Saunders, 1986, pp 551-617
8. Wacker WEC, Parisi AF: Magnesium metabolism. *N Engl J Med* 1968; 278:658-663
9. Coburn JW, Massry SG, Kleeman CR: The effect of calcium infusion on renal handling of magnesium with normal and reduced glomerular filtration rate. *Nephron* 1970; 7:131-143
10. Fawcett DW, Gens JP: Magnesium poisoning following an enema of epsom salt solution. *JAMA* 1984; 123:1028-1029
11. Jones J, Heiselman D, Dougherty J, et al: Cathartic-induced magnesium toxicity during overdose management. *Ann Emerg Med* 1986; 15:1214-1218

Occult Mineral Oil Pneumonitis in Anorexia Nervosa

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ANOREXIA NERVOSA-BULIMIA is a disorder primarily affecting young, white, middle-class women.¹⁻³ Due to the altered nutritional state associated with this condition, many secondary medical disorders occur.⁴ Associated pulmonary complications are uncommon.^{1,2} We present the case of a patient with a previously unreported complication of anorexia nervosa—occult mineral oil aspiration leading to respiratory failure.

Report of a Case

The patient, a 36-year-old woman, had a 20-year history of anorexia nervosa and bulimia associated with diuretic, laxative, and alcohol abuse plus depression with multiple suicide attempts. She was admitted due to the recent development of peripheral edema with a 12-kg (25-lb) weight gain. On physical examination on admission she was unkempt, cachectic,

and appeared chronically ill, with ascites and anasarca, but in no acute distress. The cardiopulmonary examination showed no abnormalities. Laboratory evaluation revealed a hematocrit of 33% and abnormal liver function test values, including an albumin of 1.4 mg per dl. The leukocyte count, electrolytes, renal function, chest x-ray film, and an electrocardiogram (ECG) were normal.

Enteral alimentation and vitamin replacement were initiated, with a 3-kg (6-lb) weight gain over the next week. On the seventh hospital day, acute respiratory distress developed, and the patient had a temperature of 38.6°C (101.4°F). She said her only new symptom was dyspnea. On physical examination there were bilateral rales, expiratory wheezes, bibasilar dullness, jugular venous distension with a summation gallop, and anasarca. Laboratory tests showed a hematocrit of 26%, a leukocyte count of 19,600 per μ l and arterial blood gas values with the patient breathing 100% oxygen by mask of pH 7.37, a partial carbon dioxide pressure of 44 torr, and a partial oxygen pressure of 62 torr. The ECG was unchanged. A chest x-ray film (Figure 1) showed an increased cardiac size, hilar haziness, bilateral alveolar infiltrates predominantly in the upper lobes, and bilateral pleural effusions. A bilateral thoracentesis revealed transudates, and a sputum Gram's stain showed mixed flora. Vigorous treatment including diuresis, transfusion, bronchodilators, and antibiotic coverage for nosocomial aspiration was initiated.

Despite the above treatment, the patient's condition deteriorated, requiring intubation and mechanical ventilation. Oxygen concentrations in the 70% to 80% range with 10 cm water of positive end-expiratory pressure were initially necessary to maintain adequate oxygenation. A right heart catheterization showed a cardiac output of 6.3 liters per minute and a mean pulmonary artery wedge pressure of 26 mm of mercury. On a gated blood pool study, there was a reduced left ventricular ejection fraction of 52% with no regional wall abnormalities, and an echocardiogram revealed septal dyskinesia, mild generalized hypokinesia, and a small pericardial effusion. Several sputum cultures grew mixed flora.

Five days after intubation, a temperature of 38.5°C (101.3°F) developed, and chest x-ray film findings worsened. A fiberoptic bronchoscopy showed no abnormalities. Trans-

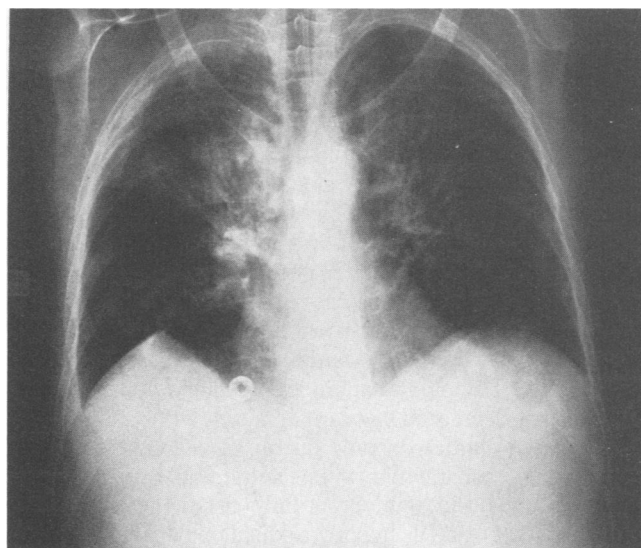


Figure 1.—A chest roentgenogram shows acute respiratory failure with upper lobe pneumonitis and superimposed congestive heart failure.

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bronchial biopsy specimens of the lingula revealed diffuse, nonspecific, organizing alveolitis. Cultures and special stains for viral, *Legionella*, mycobacteria, fungal, and *Pneumocystis* infection were all negative. The patient was diuresed to her dry weight, and a seven-day course of antibiotics for aspiration was completed. The endotracheal tube was removed on the 15th hospital day, with the patient receiving adequate oxygenation on 4 liters per minute of oxygen by cannula plus 40% mist mask. A chest x-ray film (Figure 2) showed a bilateral diffuse interstitial infiltrate. The patient remained stable and was transferred to a ward.

Three days later the patient had increasing dyspnea and hypoxemia. A repeat chest roentgenogram showed increasing alveolar infiltrates. Because of a concern for factitious disease, a room search was undertaken, revealing two bottles of mineral oil. On confrontation, the patient admitted using the mineral oil in her food as a "low-calorie way to get oil in my diet," but said she did not aspirate. The patient's pulmonary state continued to deteriorate. A right heart catheterization showed a normal cardiac output and wedge pressure.

She subsequently underwent a right lower lobe open-lung biopsy. Histologic examination (Figure 3) showed severe lipoid pneumonitis, bronchiolitis, and patchy interstitial fibrosis. A retrospective review of the transbronchial biopsy specimens showed macrophage vacuolization suggestive of lipoid material removed by tissue processing. Postoperatively the patient was surreptitiously observed to volitionally aspirate liquids. She was placed under close observation, and her condition stabilized. Pulmonary function tests showed severe restrictive disease, and 5 liters of oxygen per minute via a nasal cannula was required to maintain adequate oxygenation. Because of her severe disease, a regimen of corticosteroids was started, with 40 mg of prednisone tapered to 10 mg. On her 37th hospital day, she was discharged to an inpatient psychiatric service. Since discharge the patient has progressively improved. Her corticosteroid dosage has been discontinued, and she currently requires oxygen supplementation only with exercise.

Discussion

Pulmonary complications of anorexia nervosa are unusual and have received little attention in the medical literature. Review of the many medical complications associated with eating disorders suggests several possible mechanisms that can contribute to respiratory failure. Although lipoid pneumonia was the major disease process in this patient, there were other potential contributing factors.

Cardiac dysfunction associated with anorexia is well documented.⁵⁻⁷ Congestive heart failure due to this is generally easily managed but may result in significant pulmonary compromise.⁶ Echocardiography in anorexic patients shows a decrease in left ventricle thickness and stroke volume, plus an increase in ventricular dimensions with refeeding, suggesting volume overload due to myocardial dysfunction and an added solute load.⁵ Pathologic examination of malnourished patients reveals decreased myocardial muscle mass and fibrosis. An increased cardiac demand due to an anabolic state with refeeding, in conjunction with anemia and thiamine deficiency, can result in high output failure. Other possible contributing factors include hypothyroidism, hypokalemia, hypophosphatemia, and a cardiomyopathy associated with ingesting ipecac.⁸⁻¹⁰ In addition, extracellular fluid retention is potentiated by an increased renal sensitivity to aldosterone

during refeeding and a decreased oncotic pressure due to hypoalbuminemia.^{9,11}

Infection related to malnutrition is well documented. Patients with kwashiorkor and protein-calorie malnutrition have been shown to have cell-mediated and, to a lesser extent, humoral immunodeficiency.¹² In addition, leukopenia and hypocomplementemia are frequently present. Gotch and co-workers reported a granulocyte killing defect in three anorexic patients with staphylococcal infections that resolved with nutritional repletion.¹³ A case of anorexia with hypocomplementemia and recurrent cellulitis has been reported.¹⁴ An increased incidence of tuberculosis in men with anorexia nervosa has also been cited.¹⁵ Despite this, in several reviews of medical complications of anorexia nervosa, no increased incidence of recurrent community-acquired or opportunistic infections has been described.^{1,3,4} Armstrong-Esther and associates investigated the immune response in anorexic patients and found no cell-mediated or humoral deficiency.¹⁵ A possible explanation is that anorexia nervosa, in contrast to kwashiorkor, is most often a carbohydrate deficiency state with adequate protein stores.¹⁶ In spite of the peripheral neu-

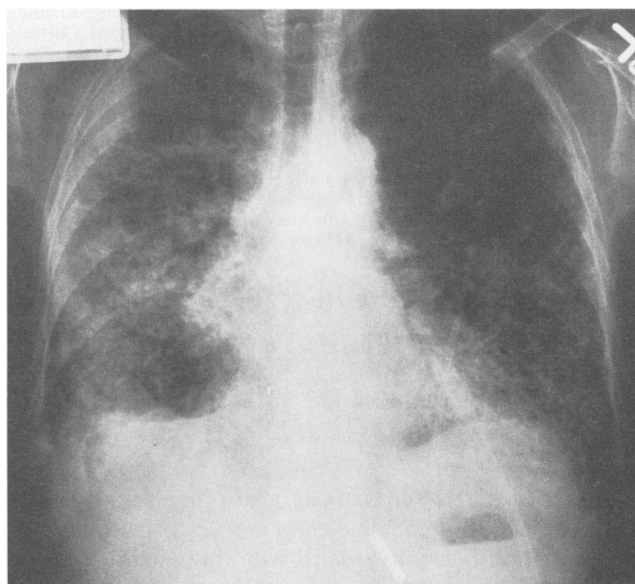


Figure 2.—A chest roentgenogram shows the chronic stage of lipoid pneumonitis with extensive fibrosis.

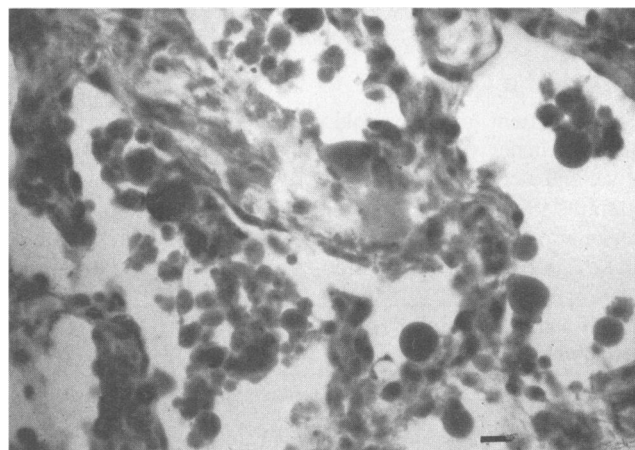


Figure 3.—An open-lung biopsy specimen from the right lower lobe shows extensive lipoid deposition with macrophage phagocytosis and interstitial fibrosis (oil red O stain, original magnification $\times 200$).

tropenia associated with anorexia nervosa, marrow reserves are adequate and there is no increased incidence of associated opportunistic infections.¹⁷

Another possible cause of pulmonary injury in malnourished patients involves an associated antioxidant deficiency. Glutathione and other similar proteins are depleted in malnourished patients. In animal studies, increased susceptibility to oxygen toxicity occurs with starvation, especially at the oxygen concentrations required to oxygenate our patient.^{18,19}

Several behaviors associated with anorexia nervosa and bulimia predispose patients to pulmonary complications. Pneumomediastinum has been reported in association with bulimia.²⁰ Aspiration of foreign material is also a major concern. Though mentioned in reviews, there are no reports documenting this complication.⁴ Self-mutilative behavior without suicidal intent, in addition to alcohol and drug abuse, is frequently seen in bulimic patients.²¹ The circumstances surrounding our patient's lipid pneumonitis suggest a volitional component. The use of mineral oil as a laxative with accidental inhalation or aspiration is also possible.

Exogenous lipid pneumonia is an unusual pulmonary problem and has not been reported previously in association with anorexia nervosa.²² Though most often found as a slowly progressive, minimally symptomatic disease process, it occasionally presents as an acute pneumonitis.^{23,24} There is a high incidence of secondary infection due to plugging and impaired mucociliary clearance.^{25,26} Occasionally the pneumonitis progresses to interstitial fibrosis.²⁷ Respiratory failure is rare. Several factors mentioned previously may have contributed to this patient's pulmonary disease, although pathologically no other cause could be found. The use of corticosteroids has been suggested as a potential treatment.²⁸ With corticosteroid treatment, our patient has shown moderate improvement in lung function, suggesting resolution of the acute pneumonitis with residual fibrosis.

Pulmonary disorders in patients with anorexia nervosa are uncommon, though multiple complications can occur. With the frequent abuse of laxatives, including mineral oil, by anorexic patients, lipid pneumonia may develop more commonly than previously appreciated. The insidious nature of lipid pneumonia makes this an easily overlooked and potentially severe complication, which requires a high index of suspicion for prompt diagnosis.

REFERENCES

- Herzog DB, Copeland PM: Eating disorders. *N Engl J Med* 1985; 313:295-303
- Schwabe AD, Lippe BM, Chang RJ, et al: Anorexia nervosa. *Ann Intern Med* 1981; 94:371-381
- Harris RT: Bulimarexia and related eating disorders with medical complications. *Ann Intern Med* 1983; 99:800-807
- Brotman AW, Rigotti NA, Herzog DB: Medical complications of eating disorders. *Compr Psychiatry* 1985; 26:258-272
- Heymfield SB, Bethel RA, Ansley JD, et al: Cardiac abnormalities in cachectic patients before and during nutritional repletion. *Am Heart J* 1978; 95:584-594
- Gottdiener JS, Gross HA, Henry WL, et al: Effects of self-induced starvation on cardiac size and function in anorexia nervosa. *Circulation* 1978; 58:425-433
- Brotman AW, Stern TA: Case report of cardiovascular abnormalities in anorexia nervosa. *Am J Psychiatry* 1983; 140:1227-1228
- Hurd HP, Palumbo PJ, Gharib H: Hypothalamic-endocrine dysfunction in anorexia nervosa. *Mayo Clin Proc* 1977; 52:711-716
- Fohlin L: Body composition, cardiovascular and renal function in adolescent patients with anorexia nervosa. *Acta Paediatr Scand [Suppl]* 1977; 268:1-20
- Adler AG, Wolinsky P, Krall RA, et al: Death resulting from ipecac syrup poisoning. *JAMA* 1980; 243:1927-1928
- Spark RF, Arky RA, Boulter PR, et al: Renin, aldosterone and glucagon in the natriuresis of fasting. *N Engl J Med* 1975; 292:1335-1340
- Low DK, Dudrick SJ, Abdou NI: Immunocompetence of patients with protein-calorie malnutrition. *Ann Intern Med* 1973; 79:545-550

- Gotch FM, Spry CJF, Mowat AG, et al: Reversible granulocyte killing defect in anorexia nervosa. *Clin Exp Immunol* 1975; 21:244-249
- Kim Y, Michael AF: Hypocomplementemia in anorexia nervosa. *J Pediatr* 1975; 87:582-585
- Armstrong-Esther CA, Lacey JH, Crisp AH, et al: An investigation of the immune response of patients suffering from anorexia nervosa. *Postgrad Med* 1978; 54:395-399
- Crisp AH: Anorexia nervosa—Feeding disorder, nervous malnutrition or weight phobia. *World Rev Nutr Diet* 1970; 12:452-504
- Bowers TK, Eckert E: Leukopenia in anorexia nervosa. *Arch Intern Med* 1978; 138:1520-1523
- Deneke SM, Fanburg BL: Normobaric oxygen toxicity of the lung. *N Engl J Med* 1980; 303:76-86
- Deneke SM, Gershoff SN, Fanburg BL: Potentiation of oxygen toxicity in rats by dietary protein or amino acid deficiency. *J Appl Physiol* 1983; 54:147-151
- Donley AJ, Kemple TJ: Spontaneous pneumomediastinum complicating anorexia nervosa. *Br Med J* 1978; 2:1604-1605
- Garfinkel PE, Moldofsky H, Garner DM: The heterogeneity of anorexia nervosa as a distinct subgroup. *Arch Gen Psychiatry* 1980; 37:1036-1040
- Miller A, Bader RA, Bader ME, et al: Mineral oil pneumonia. *Ann Intern Med* 1962; 57:627-634
- Kennedy JD, Costello P, Balikian JP, et al: Exogenous lipid pneumonia. *AJR* 1981; 136:1145-1149
- Weill H, Ferrans VJ, Gay RM, et al: Early lipid pneumonia. *Am J Med* 1964; 36:370-376
- Bishop G: Oil aspiration pneumonia and pneumolipidosis. *Ann Intern Med* 1940; 23:1327-1359
- Volk BW, Nathanson L, Losner S, et al: Incidence of lipid pneumonia in a survey of 389 chronically ill patients. *Am J Med* 1951; 10:316-324
- Genereux GP: Lipids in the lungs: Radiologic-pathologic correlation. *J Can Assoc Radiol* 1970; 21:2-15
- Ayvazian LF, Steward DS, Merkel CG, et al: Diffuse lipid pneumonitis successfully treated with prednisone. *Am J Med* 1967; 43:930-934

Coexistent Dermatomyositis and Autoimmune Thyroiditis

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DERMATOMYOSITIS is a disease characterized by nonsuppurative inflammation of skeletal muscle and characteristic skin changes. While dermatomyositis-like syndromes due to hypothyroidism have been well described, the occurrence of both hypothyroidism due to autoimmune thyroiditis and dermatomyositis together is not well documented.

We describe the case of a patient with coexistent autoimmune thyroiditis and dermatomyositis, showing clearly that these diseases can coexist. He was treated with pharmacologic doses of both steroids and thyroid hormone and is in clinical remission after two years.

Report of a Case

The patient, a 50-year-old male rice farmer, presented with proximal muscle weakness, Raynaud's phenomenon, dysphagia, hoarseness, and loss of energy for six months. On physical examination he had profound muscle weakness in the limb girdle and neck flexors. The patient was unable to lift his head from the pillow, rise from a chair, or walk up stairs without assistance. No fasciculations were seen. The neurologic examination elicited no abnormalities. Examination of the neck showed no goiter. His skin was remarkable for pronounced periungual erythema, a heliotrope rash over the upper eyelids, and Gottron's papules on the knuckles.

Admission laboratory tests were remarkable for the fol-

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